

REMARKS

The independent claims 1, 36, 51, 58, 59, 60, 66, 69 and 72 along with dependent claims 2-20, 28-30, 33-35, 37-42, 61-65, 67-68, 70-71 and 73-76, were rejected under 35 USC 102(b) as being anticipated by Sun. Dependent claims 21-27, 31-32, and 43-59 were rejected under 35 USC 103(a) as being obvious based on Sun in view of Ganesan. Favorable reconsideration of this application is requested in view of the claim amendments and the following remarks.

Drawing Changes

Drawings, 1, 2, 5, 7, 10, 11 and 14 were objected to as failing to properly notate prior art subject matter. Drawings 1, 2, 5 and 7 have been corrected to include the prior art notation. However, Applicant respectfully asserts that figures 10, 11 and 14 illustrate non-prior art subject matter, specifically the non-linearity of the gradient field.

102 Rejection

Sun does not teach or suggest Applicant's amended "non-linear gradient field...." Instead, Sun assumes an applied gradient that is linear along a y-axis. (Col. 5:40-49.) However, Applicant's disclosed subject matter recognizes the nonlinearity of the gradient field and describes its azimuthal/tangential imaging based on this nonlinearity. This is discussed in detail in Applicant's specification at page 17, line 17 – page 18, line 6, page 21, lines 14-22 and page 25, line 16 – page 26, line 16. This is an important distinction as the ideal model of Sun having linear gradients is difficult to achieve in real-world applications. For at least this reason, and in light of the amendments, the rejections of the independent claims 1, 36, 51, 58, 59, 60, 66, 69 and 72 is respectfully traversed.

With respect to amended claim 7, Sun does not teach or suggest a magnetic field gradient where "each magnetic field gradient...is oriented circumferentially...relative to the wellbore." (Applicant's specification, page 17, lines 10-16 and figure 9.) Instead, Sun describes use of four gradient coils, each generating a local gradient field surrounding that particular coil. (Sun, figure 13.) It is the combination of activated coils in Sun which generates the total azimuthal

gradient field. (Sun, figure 38.) At least one advantage of Applicant's azimuthal gradient field generated from a single coil is the associated power savings.

With respect to claims 11 and 15, Sun does not teach or suggest Applicant's specific gradient dephasing sequence. Specifically, Sun proposes applying the dephasing gradient just before and after the first 180 RF pulse. (Sun, figures 15-18.) However, since both the static and RF field in the borehole NMR spectrometer is inhomogeneous, these dephasing gradients may not cancel each other perfectly. In part because of this concern, Applicant's claim application of the dephasing gradient just prior to the echo and rephasing it again after the echo. (Applicant's specification, figures 13 and 16.)

With respect to amended claims 12 and 61, Sun does not teach or suggest azimuthal imaging using a "...single gradient coil..." Instead, as described above, Sun achieves its azimuthal gradient by firing each of its four gradient coils. By providing a single gradient coil that generates a gradient field circumferentially around the wellbore, Applicants achieve a power savings benefit.

With respect to amended claims 16, 37 and 62, Sun does not teach or suggest deriving an azimuthal image from two pulse sequences. Instead, as described above, Sun achieves its azimuthal gradient by firing each of its four gradient coils, independently, then again all together. By reducing the number of requisite sequences, Applicants achieve a power savings benefit as well as an improvement in logging speed.

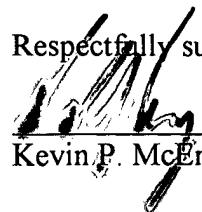
The dependent claims not specifically discussed above are allowable as depending from allowable claims. Based on these comments and the claim amendments, reconsideration of the rejections is respectfully requested.

CONCLUSION

Applicants believe this paper is fully responsive to each and every ground of rejection and objection cited by the Examiner in the Office Action dated June 11, 2003, and respectfully request reconsideration of the application.

Please charge any applicable fees, or apply any excess, to deposit account number 19-0610.

Respectfully submitted,



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Date

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